

# THE BENEFITS OF UPGRADING A SAN INFRASTRUCTURE USING BROCADE TECHNOLOGY

The decision to upgrade a Brocade SAN infrastructure largely depends on strategic SAN infrastructure growth plans.

With the widespread availability of 2 Gbit/sec Storage Area Network (SAN) solutions and the advent of 4 Gbit/sec SAN solutions, organizations that currently have 1 Gbit/sec Fibre Channel SAN infrastructures now have a wider range of choices for upgrading those environments. Today, Brocade® is at the forefront of providing powerful new solutions with the comprehensive family of SilkWorm® entry-to-enterprise SAN solutions featuring 2 and 4 Gbit/sec Fibre Channel capabilities. This paper examines some of the issues that organizations might need to consider during a technology refresh decision and highlights key benefits of implementing a strategic SAN infrastructure.

### THE VALUE OF A SAN INFRASTRUCTURE UPGRADE

As SAN technology continues to mature with the next generation of innovative solutions, today’s organizations must continually re-evaluate how effectively their SAN infrastructures are solving their business requirements. While it might be easy to understand upgrading a SAN network infrastructure from 1 Gbit/sec Fibre Channel to 2 or 4 Gbit/sec Fibre Channel in terms of increased network bandwidth, there are several other strategic benefits that result from a progressive evolution of the IT storage infrastructure.

As organizations consider the advantages of upgrading their SAN infrastructures to newer, higher-bandwidth solutions, they can expect to find a wide range of business advantages, as summarized in Table 1.

**Table 1.**  
The advantages of Brocade  
2 and 4 Gbit/sec SAN solutions

Benefit	Description
SAN Fabrics Optimized for Future Growth	Brocade 2 and 4 Gbit/sec SAN offerings are designed to enable a SAN infrastructure for next-generation SAN services such as Information Lifecycle Management (ILM) and storage utility computing. In addition, they are designed to provide an end-to-end conduit for shared/consolidated storage through innovative server-facing tasks in the future.
SAN Scalability with Greater Resource Utilization	Brocade 2 and 4 Gbit/sec SAN switches provide high port counts and higher network bandwidth through technologies such as Inter-Switch Link (ISL) Trunking—enabling simpler, more scalable SAN designs and improving overall resource utilization.
Higher Availability and Improved SAN Management	Brocade 2 and 4 Gbit/sec enterprise switches provide features such as hot code activation to support a higher degree of SAN availability. In addition, these offerings continue to improve system management through compliance with standards such as SMIS.
Improved Environmental Efficiency	Brocade 2 and 4 Gbit/sec SAN switches are based on advanced Brocade ASIC architectures, resulting in switches that require less power and cooling yet achieve higher Mean Time Between Failure (MTBF) ratings.
Optimized Performance	Brocade 2 and 4 Gbit/sec SAN switches provide higher SAN bandwidth for specific devices today (such as high-speed tape devices) and also enable flexible SAN performance scalability over time.

This paper covers some of the key issues involved in a SAN infrastructure upgrade decision, including when it is reasonable to maintain an existing SAN infrastructure and when the advantages of a Brocade 2 or 4 Gbit/sec SAN infrastructure make an upgrade the best decision. The scope of this paper does not cover actual SAN upgrade methodology and design issues, which should always be discussed in detail with a SAN provider.

#### **WHEN IT MAKES SENSE TO KEEP AN EXISTING SAN INFRASTRUCTURE**

The decision of whether to upgrade an existing SAN infrastructure typically involves factors that are related to business processes as well as technologically related factors. One critical factor is whether the business case requires that a production SAN have no changes made to it—including servers, storage devices, storage applications, and SAN infrastructure.

Other factors guiding a decision towards upgrading a SAN infrastructure might include the overall SAN growth *plans*—whether the servers and storage devices will be upgraded to 2 or 4 Gbit/sec SAN technology or whether there are any SAN performance concerns. Lastly, an upgrade decision might be based on the need to implement new features available only in the latest SAN technology.

#### **SAN FABRICS OPTIMIZED FOR GROWTH**

One of the most important—and common—reasons for upgrading a SAN infrastructure is to support a strategic, next-generation storage environment. Many SAN vendors have begun introducing storage system strategies that will enable ILM and storage utility computing with an overall goal of a more autonomous storage infrastructure.

In order to build a storage infrastructure that supports this type of functionality, the SAN infrastructure must be capable of automating many functions that administrators perform manually today. As a result, the infrastructure must be capable of performing tasks such as automatic storage allocation, automatic storage replacement, automatic data backup, and concurrent data access whenever it is required.

A key step in this process is building a SAN infrastructure based on high-performance switch architectures, both at the bandwidth level and the switch engine level. In addition to increasing the network bandwidth of the switches themselves, Brocade 2 and 4 Gbit/sec SAN solutions are based on a powerful CPU and fabric operating system architecture. And while it is still relatively early to fully assess the projected system requirements of ILM and storage utility computing, SAN bandwidth requirements will undoubtedly increase with these new services. In fact, some analysts estimate that implementing these types of next-generation storage technologies might result in four times the current amount of SAN traffic—necessitating a SAN infrastructure optimized for continued expansion.

#### **Intelligent Next-Generation Solutions**

To support this type of next-generation storage infrastructure, SAN vendors are beginning to develop new technologies that will enable storage management applications running within the SAN infrastructure. While some of this technology will likely

offer backward compatibility with 1 Gbit/sec SAN infrastructures, many key functions are likely to be designed solely for more recent 2 and 4 Gbit/sec switching platforms.

For example, Brocade has recently introduced the SilkWorm Fabric Application Platform, an intelligent next-generation SAN solution that will enable server and storage vendors to integrate Server Lifecycle Management (SLM) and Information Lifecycle Management (ILM)—along with file and storage utility computing applications—into the SAN infrastructure in a scalable, robust manner. As a result, implementing a 2 or 4 Gbit/sec switching infrastructure leveraging this type of solution can immediately increase SAN functionality while enabling a foundation for long-term strategic storage initiatives.

#### **A Flexible Design for Both Investment Protection and Growth**

Another key aspect to understanding long-term network bandwidth requirements is to consider overall network design. Networks must be designed to accommodate a certain amount of converged traffic at the heart of the network as well as end-point traffic. Much like road systems where smaller-capacity roads feed into and out of major-capacity highways, SAN designs can incorporate a mix of higher-capacity SAN switching technology within an inner core that is fed by smaller-capacity SAN switches on the edges.

Because network designs typically evolve over time, introducing newer technology into the network core and moving older technology to the outer edge can be a good way to combine strategic functionality with investment protection to maximize overall value. In this way, planning a strategic SAN infrastructure upgrade project around new 2 and 4 Gbit/sec technology today can provide the necessary bandwidth for years to come.

#### **SAN SCALABILITY WITH GREATER RESOURCE UTILIZATION**

Another key to building a strategic SAN infrastructure is to maximize the investment in both existing and future IT resources. Flexibility and easy scalability to higher-port-count SAN switches helps ensure efficient, incremental growth in an affordable manner.

To support these scalable SAN infrastructures, Brocade 2 Gbit/sec SAN offerings provide high-speed switching technology from entry-level 8-port switches all the way up to a 128-port director (the SilkWorm 24000). This bladed director model enables SANs built around a single 14U chassis with the high port density required to build simplified, highly scalable SAN topologies. In other words, organizations can build larger SAN fabrics (from a port perspective) with fewer switches.

For example, a 220-port SAN fabric can consist of:

- Two SilkWorm 24000 directors connected together
- One SilkWorm 24000 connected to four SilkWorm 3900 switches (32-port 2 Gbit/sec switches)
- 10 SilkWorm 3900 switches connected together

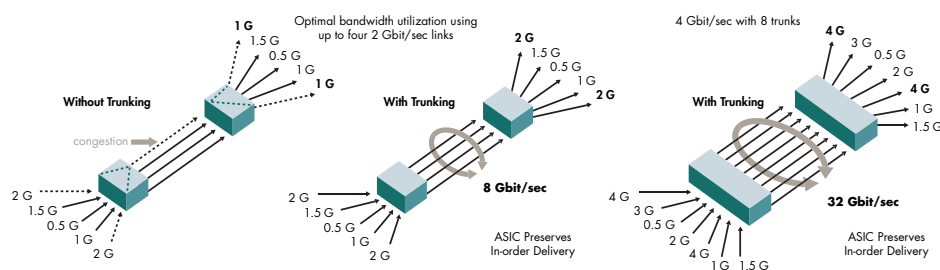
In contrast, a 220-port fabric would require eighteen 16-port switches. The end result is that higher-port-count switches enable much greater flexibility in building larger SAN fabrics with simpler network designs. In addition, larger SAN fabrics typically enable higher utilization of the connected storage and server resources due to the fact that more devices can directly “see” each other. By building their SAN fabrics in this manner, organizations can deploy higher “fan-in” ratios of servers to storage devices—helping increase resource utilization.

### Flexible Ports On Demand Scalability

The new Brocade SilkWorm 4100 switch improves SAN scalability to an even higher degree. The industry’s first 4 Gbit/sec SAN switch, the SilkWorm 4100 is packaged in a 1U-high, 32-port form factor. Unlike previous-generation Brocade 32-port 2 Gbit/sec switches such as the SilkWorm 3900, the SilkWorm 4100 features Ports on Demand capabilities. If business growth requires additional network capacity, organizations can increase port count by simply activating a license key for 8-port increments. This additional flexibility to scale up on-demand further simplifies SAN design.

### ISL Trunking for Simplified Design

Brocade 2 and 4 Gbit/sec switches also improve SAN topology scalability and simplification by providing the industry’s first ISL Trunking technology. ISLs are simply links used to connect SAN switches into larger overall SAN fabrics. First introduced with Brocade 2 Gbit/sec switches, Brocade ISL Trunking allows up to four ISLs between two 2 Gbit/sec switches to be logically combined in order to balance data traffic across all four ISLs. This approach provides a single logical ISL with up to 8 Gbit/sec of bandwidth (see Figure 1).



**Figure 1.**  
ISL Trunking with 2 and  
4 Gbit/sec links

With Brocade 4 Gbit/sec SAN technology, ISL Trunking supports up to eight ISLs between 4 Gbit/sec switches, providing a single logical ISL trunk of up to 32 Gbit/sec of bandwidth. This enhanced ISL Trunking capability reduces the number of ISLs required for a SAN fabric core, yet increases overall throughput. In turn, the smaller number of ISLs simplifies the overall fabric configuration. A carryover benefit is that a SAN design with fewer switches helps reduce administrative and management workload.

### **HIGHER AVAILABILITY AND IMPROVED SAN MANAGEMENT**

Especially in mission-critical enterprise environments, a SAN infrastructure must support the most demanding business requirements in terms of data accessibility and security. To address this need, the 2 Gbit/sec SilkWorm 12000 and SilkWorm 24000 directors are designed to provide the highest possible levels of SAN availability.

Key features include cooling units and power supplies that can be replaced without interrupting switch operations. In addition, these directors have hot-swappable components, including port blades, World Wide Name (WWN) cards, and control processor blades. Organizations can utilize these capabilities to build high-port-count fabrics with unprecedented levels of SAN availability.

The enterprise-class 2 Gbit/sec SilkWorm 3900 and 4 Gbit/sec SilkWorm 4100 switches also feature hot-swappable architectures in which power supplies and cooling units can be replaced while the switch is running. In addition, the underlying switch engine architecture means that every Brocade 2 and 4 Gbit/sec switch natively supports key high-availability features, such as hot code activation. All of these switches can be updated with the latest version of Brocade Fabric OS® without interrupting data flow through the switch.

One area in particular that has benefited from high-availability Fibre Channel switch architectures is FICON® communication support for mainframe computing environments. Brocade 2 Gbit/sec SAN offerings that support FICON and CUP management are the SilkWorm 12000, 24000, and 3900.

Another important factor in overall system availability is a robust fabric operating system that helps keep data readily accessible. In terms of SAN management, Brocade continues to broaden Fabric OS with improved functionality and easier access to management features through the Brocade Fabric Access API. This management access layer enables organizations and third-party software applications to directly access and manage Brocade SAN fabrics. The expanded management functionality supports easier, more proactive SAN management—a key factor in building cost-effective availability into strategic SAN designs.

In addition to availability, security is also critical for a reliable SAN infrastructure. Brocade Secure Fabric OS® provides important change management and intruder security features to control changes to the SAN as well as prevent unauthorized data access.

### **IMPROVED ENVIRONMENTAL EFFICIENCY**

While upgrading to a new SAN infrastructure might initially seem like a costly process, doing so can actually provide cost savings in the area of environmental efficiency and ongoing maintenance. As Brocade continues to build its next-generation SAN switching technology, the innovation begins with the switch ASIC architecture and the features it provides. One of the important long-term innovations in the ASIC design is the significantly improved environmental efficiency, translating into switches that consume less power, run cooler, are quieter, and operate longer between failures.

In fact, the environmental differences between product generations can be dramatic. For instance, a fully populated SilkWorm 24000 consumes only 750 watts—63 percent less power than a fully populated SilkWorm 12000. Because less power is required, less heat is generated and less cooling is needed. At the same time, Mean Time Between Failure (MTBF) is much better in the SilkWorm 24000 compared to the SilkWorm 12000.

These environmental efficiencies also apply to next-generation Brocade 4 Gbit/sec switch technology. A brand new ASIC architecture provides new capabilities, such as enhanced ISL Trunking and extended long-distance support as well as the improved environmental. For example, the 4 Gbit/sec SilkWorm 4100 consumes only 75 watts of power compared to the 125 Watts consumed by the 2 Gbit/sec SilkWorm 3900. The SilkWorm 4100 also has approximately 33 percent better MTBF in a smaller footprint. In fact, three SilkWorm 4100 switches fit into the same rack space as two previous-generation SilkWorm 3900 switches.

For organizations considering whether to upgrade their SAN infrastructures, the latest generation of technology can immediately provide cost savings in terms of utilities, footprint, and maintenance. And over the long term, network infrastructure environmental will certainly be much better than with older SAN technologies.

#### **OPTIMIZED PERFORMANCE**

Upgrading a network infrastructure for performance reasons is something that most organizations typically understand. However, assessing the performance needs of a SAN design can take time as the SAN infrastructure matures and grows. In many cases, specific, not overall, performance issues will surface with the SAN design.

For instance, sometimes it makes sense to build higher-cost, higher-speed network bandwidth into specific parts of a SAN infrastructure—and build more lower-cost, higher-connectivity bandwidth into other parts. A good design strategy is to make smaller incremental changes to resolve specific issues, and then evolve the overall design as time, budget, and requirements allow.

To facilitate non-disruptive and affordable design changes, Brocade 2 and 4 Gbit/sec SAN offerings provide a complete solution—from the enterprise to the entry level and also through SAN switches embedded in servers. With complete backward and forward compatibility based on a common Fabric OS, each Brocade product segment is designed to support the seamless expansion of high-performance, highly scalable SAN environments.

#### **ISL Trunking for the Highest Performance**

When it comes to supporting the most demanding application requirements, all Brocade 2 and 4 Gbit/sec offerings provide high-speed 8 Gbit/sec ISL Trunking (2 Gbit/sec offerings) and 32 Gbit/sec ISL Trunking (4 Gbit/sec offerings). In addition, Brocade 4 Gbit/sec SAN technology introduces Dynamic Path Selection, a new feature that balances SAN traffic workload across ISL trunk groups to help optimize overall fabric performance.

### **Innovative Performance Monitoring Tools**

Brocade 2 and 4 Gbit/sec switches also enable a new level of SAN performance tuning with Brocade Advanced Performance Monitoring software, which can provide timely performance metrics from any source to any destination within the SAN fabric. This historical performance data can be collected for future use with the next generation of intelligent SAN management applications.

Brocade also offers a groundbreaking SAN analysis tool to help organizations evaluate their SAN growth and migration strategies. The Brocade SAN Health utility provides organizations with Visio diagrams of their SAN configurations as well as detailed reports for historical performance and recommended best practices. This utility can help organizations better understand their current SAN environment and make more informed decisions about SAN performance, scalability, and potential consolidation options in the future.

### **SUMMARY**

Any decision to upgrade a SAN infrastructure must be balanced against what the SAN must deliver in terms of service and functionality. If self-containment is the key, and the SAN is performing at an acceptable level, no changes to the SAN are required.

However, if the SAN is part of an IT infrastructure that must continue to grow, evolve rapidly, and keep pace with technological advancements, 2 and 4 Gbit/sec SAN solutions should be an integral part of any strategic storage infrastructure.

For more information about Brocade 2 and 4 Gbit/sec SAN solutions, visit **[www.brocade.com](http://www.brocade.com)**.



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